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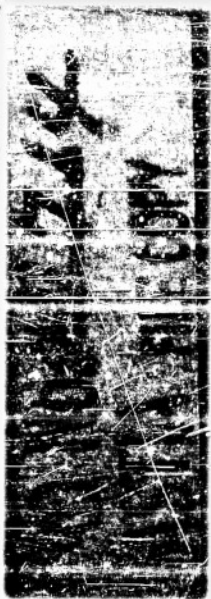
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RADIO INTERFERENCE

URROUGHS CORPORATION

DETROIT 32, MICHIGAN

REPORT NO. NP 1031

INTERIM DEVELOPMENT REPORT  
ON  
THE INVESTIGATION OF THE FEASIBILITY  
OF USING MERCURY "A" BATTERIES IN  
RADIO TEST SET AN/PRM-1

FOR

NAVY DEPARTMENT BUREAU OF SHIPS ELECTRONICS DIVISION

CONTRACT NObar 63233, INDEX NO. 120828

SEPTEMBER 16, 1953

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### ABSTRACT

1. The use of regular pen light cells as bias batteries in the Radio Test Set AN/PRM-1 has proven to have some limitations for use in the field.

2. With the development of the mercury cell to a commercial level, a possible solution to the problem was evolved. The following characteristics of the mercury cell were believed to make them more applicable for this use than the conventional pen lite cell.

- a. High ratio of energy to volume and weight.
- b. Long shelf life.
- c. Leak proof and dimensionally stable construction.
- d. Uniform discharge characteristics.
- e. No need for recuperation periods.
- f. Constant potential.
- g. Resistant to impact and acceleration.

3. The investigation discussed in this report pertains only to the adaptability of 1.3 volt mercury battery cells as replacements for pen lite batteries BT 101 and BT 102 in the Radio Test Set AN/PRM-1.

## PART I

### Purpose

The purpose of this investigation was to determine the realignment procedures and changes in circuitry, if any, necessary when the conventional pen lite cells are replaced by mercury cells.

### Procedure

1. Fresh pen lite cells were installed in a Radio Test Set AN/PRM-1 and the instrument was completely aligned and calibrated.

The following quantities were observed and recorded:

- a. Calibration settings.
- b. Internal Noise (Q.P.)
- c. Field Intensity to Quasi-Peak ratio.
- d. Quasi-Peak to Peak ratio.
- e. Meter tracking.

2. The conventional pen lite cells were then replaced by the mercury cells. To do this, no re-working or otherwise altering of the holding bracket or circuit was necessary. The polarity of the mercury cells had to be closely observed, however, for the outer case is the positive electrode and the center pin the negative electrode.

The following discrepancies were noted in the operation of the instrument:

- a. The meter zero shifted.
- b. Calibration settings changed slightly.
- c. Internal noise remained the same.
- d. Field intensity to quasi-peak ratio remained the same.
- e. Quasi-Peak to Peak ratio remained the same.
- f. Meter tracking changed slightly.

3. With the mercury cells installed for batteries BT 101 and BT 102, the instrument was completely realigned and re-calibrated. The following was observed:

- a. Calibration settings returned to practically the same values as they were before the mercury cells were installed.
- b. The internal noise was reduced slightly at some frequencies, however not sufficiently enough to relate directly to the mercury cells.
- c. All other functions performed satisfactorily.

### Discussion

1. The condition of increased internal noise that occurs when the conventional pen lite cells are used for too long a period will probably be minimized by using mercury cells because of their long shelf life and even voltage characteristics.

2. Realignment and re-calibration are necessary when the conventional pen lite cells are replaced with mercury cells for the load voltage of mercury cells is approximately 1.3 volts as compared to 1.5 volts of the pen lite cells. Since these batteries (BT 101 and BT 102) serve as bias for the first IF stage and for the VTM zero adjust, changes in voltage will cause discrepancies in the circuit. Changes in bias cause the meter tracking to change and meter zero will shift. Poor meter tracking results in increased levels of internal noise.

### Conclusions

1. No circuit or components changes were necessary to install E. R. Mallory and company type RM-502 Mercury Cells. The cells have the same dimensions as conventional pen lite cells (Figure 1) and

are rated at 2400 milliamp hours.

2. The radio Test Set AN/PRM-1 will function when the conventional pen lite cells (BT-101 and BT 102) are replaced with mercury cells, but for the best and most accurate operation, the instrument should be re-aligned and re-calibrated.

## PART II

### Program for Next Interval

Investigations will continue on this problem and the feasibility of using mercury cells for the minus 9 volts bias will be evaluated. Also, the performance of the instrument with the mercury cells installed will be checked at intervals until the instrument no longer performs satisfactorily due to failure of the cells.



Standard "A" Batteries

Mercury "A" Batteries

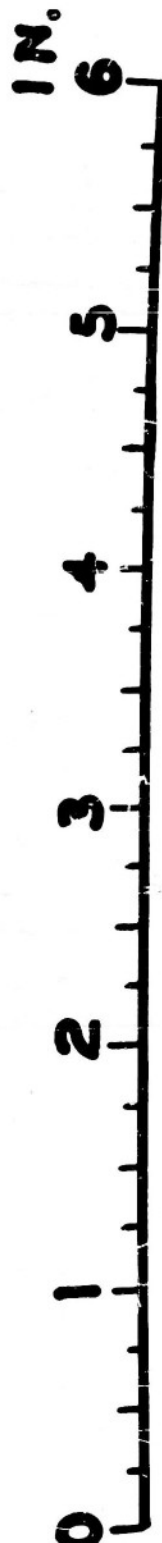
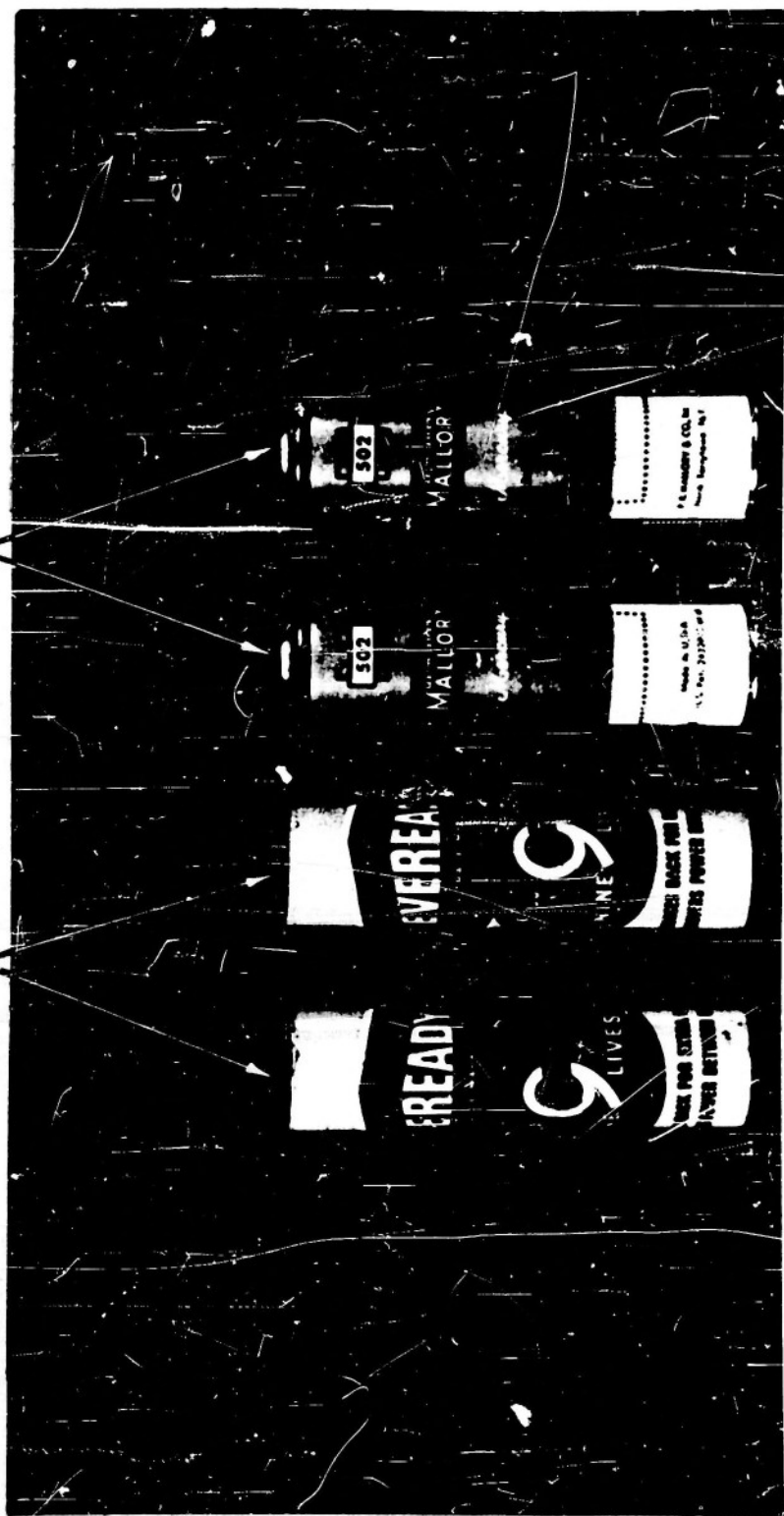
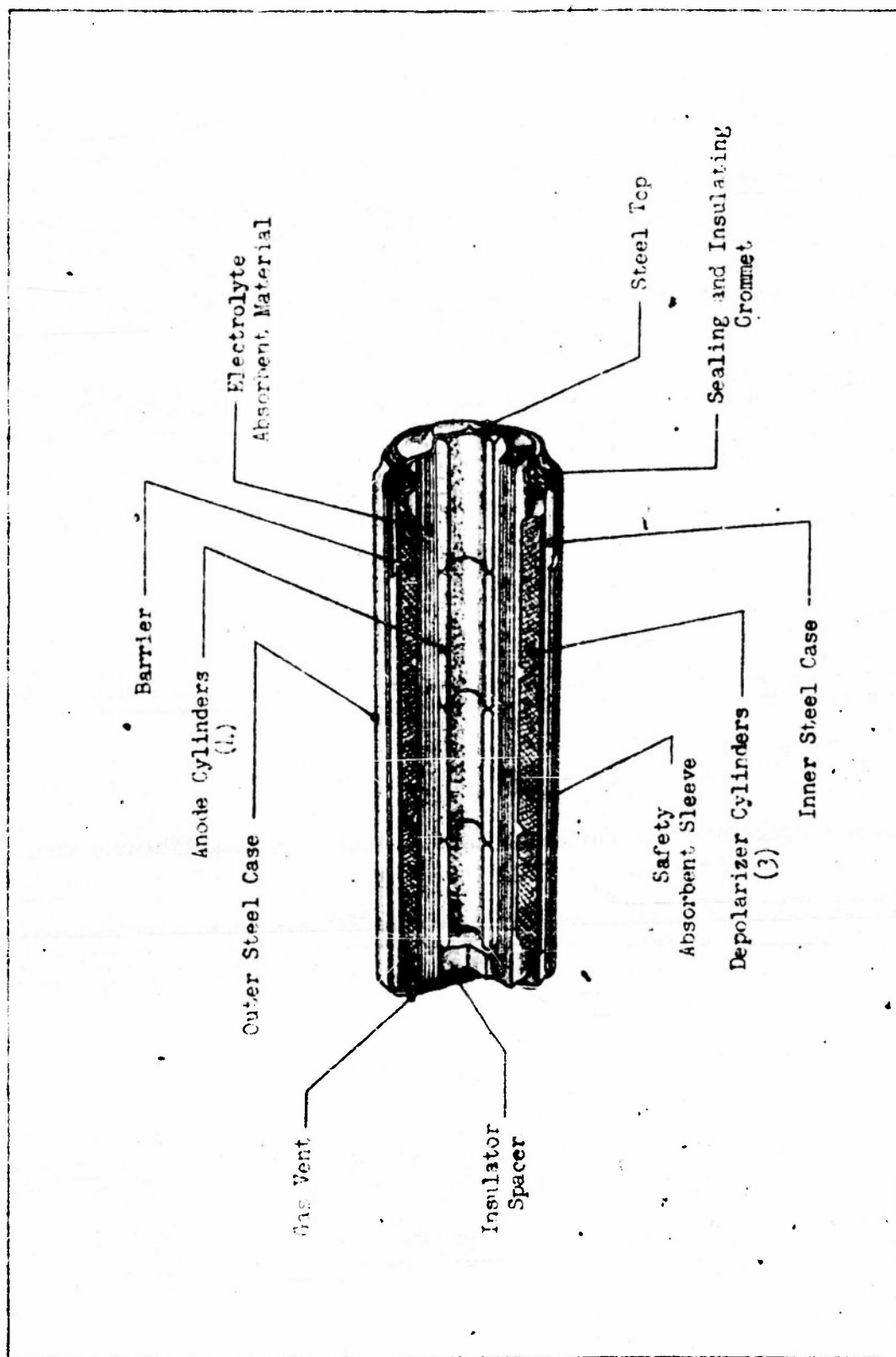


FIGURE 1

PHYSICAL COMPARISON OF MERCURY AND STANDARD "A" CELLS



**FIGURE 2**

MERCURY CELL

CYLINDRICAL TYPE PRESSED POWDER ANODE CELL OR "A" BATTERY

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